PROJECT SUMMARY

Firm: Tethers Unlimited, Inc.
Contract Number: *NNX12CA09C*
Project Title: PowerCube: Power, Propulsion, and Precision Pointing for CubeSats

Identification and Significance of Innovation:
During this Phase II research program, Tethers Unlimited has developed the HYDROS water electrolysis propulsion system for CubeSats and other small spacecraft. We have matured the technology to TRL-5 and successfully commercialized HYDROS through a sale of two units to the Air Force Institute of Technology. HYDROS has the potential to revolutionize the small satellite industry by providing high performance, scalable propulsion that is affordable, non-toxic, and easily complies with the stored energy restrictions imposed on secondary payloads. HYDROS allows spacecraft to launch with a man-rated and completely safe propellant - unpressurized water. Once on-orbit, HYDROS splits the water into gaseous hydrogen and oxygen through electrolysis and generates up to 1 N of thrust at 300 seconds of specific impulse.

Technical Accomplishments:
The major achievements of this Phase II research program include:

1. The development of a water electrolyzer optimized for operation in zero-gravity. The HYDROS electrolyzer has gone through three design iterations and has been successfully tested in vacuum and in orientations where Earth's gravity works against the electrolysis process.
2. The development of a high performance miniature bipropellant thruster. We have conducted 100+ hot fire tests and gone through many design iterations in order to optimize our thruster performance for integration with the HYDROS electrolyzer.
3. The development of a water tank designed to hydrate the electrolyzer in a zero-gravity environment.
4. Design, integration, manufacturing, and testing of the HYDROS propulsion system. During the course of this Phase II, we have developed and integrated all of the HYDROS component technologies and matured the flight design to TRL-5 through extensive testing.
5. Successful Phase III commercialization of the HYDROS water electrolysis technology through a sale of two units to the Air Force Institute of Technology (AFIT). We will be working with AFIT to enable them to perform additional testing on the HYDROS propulsion system during in summer 2014 and will support integration into a mission schedule for 2015.

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